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 * * * * * * RECONNECTED TO U.S. Patent & Trademark Office * * * * * *
SESSION RESUMED IN FILE 'USPAT' AT 14:42:19 ON 12 JUL 1999
FILE 'USPAT' ENTERED AT 14:42:19 ON 12 JUL 1999
=> s magnetic body

        268461 MAGNETIC
        673201 BODY
L7        1428 MAGNETIC BODY
                 (MAGNETIC(W)BODY)

=> d his


     (FILE 'USPAT' ENTERED AT 14:12:01 ON 12 JUL 1999)
L1          1428 S MAGNETIC BODY
L2             2 S L1 AND SOFT MAGNETIC POWDER
L3             1 S L2 AND BINDER
L4            31 S L1 AND THERMAL CONDUCTIVITY
L5            31 S L4 AND MAGNETIC
L6             0 S L5 AND MAGNETIC POWDER
L7          1428 S MAGNETIC BODY

=> s L4 and (alumina or aluminum nitride or cubic boron nitride silicon
carbide)

         96512 ALUMINA
        334933 ALUMINUM
         48746 NITRIDE
          4732 ALUMINUM NITRIDE
                 (ALUMINUM(W)NITRIDE)
         66720 CUBIC
         75100 BORON
         48746 NITRIDE
        205015 SILICON
         65543 CARBIDE
            29 CUBIC BORON NITRIDE SILICON CARBIDE
                 (CUBIC(W)BORON(W)NITRIDE(W)SILICON(W)CARBIDE)
L8           8 L4 AND (ALUMINA OR ALUMINUM NITRIDE OR CUBIC BORON NITRIDE
SIL

               ICON CARBIDE)

=> d L8 1-8 kwic


US PAT NO:     5,905,611 [IMAGE AVAILABLE]          L8: 1 of 8

SUMMARY:

BSUM(89)
```

The . . . least two magnetic films and a nonmagnetic film sandwiched between the magnetic films, a magnetic multilayered film containing a soft **magnetic body** and having a stacked structure of at least two

layers arranged on the side of the surface of the magnetoresistance. . .

SUMMARY:

BSUM(98)

The . . . a thin film head comprising a magnetoresistance effect film consisting of at least one nonmagnetic conductor and at least one **magnetic body**, wherein the nonmagnetic conductor and the **magnetic body** are arranged alternately in the same plane, and a direction of a sense current for sensing a resistance change is a direction extending through the interfacial boundary between the nonmagnetic conductor and the **magnetic body**.

SUMMARY:

BSUM(99)

In . . . flowing direction of a sense current is a direction extending through the interfacial boundary between the nonmagnetic conductor and the **magnetic body**" does not mean that the flowing direction of a sense current is perpendicular to the interfacial boundary. In addition, in. . .

SUMMARY:

BSUM(100)

In . . . antiparallel state so as to reduce the magnetostatic energy. Upon application of a magnetic field, the magnetic moment of each **magnetic body** is either rotated or reversed, and the angle defined between adjacent magnetic moments changes in accordance with the applied magnetic. . .

SUMMARY:

BSUM(101)

An . . . as a series resistance of an electrical resistance R.sub.N.M. of the nonmagnetic conductor and an electrical resistance R.sub.M. of the **magnetic body**. Like in the calculation described in Prior Art, assuming that

SUMMARY:

BSUM(114)

This . . . an example, when the track width is 1 .mu.m and lengths d.sub.1 and d.sub.2 of the nonmagnetic conductor and the **magnetic body** are 20 .ANG., which is equivalent to that in a regular artificial lattice film, the number of interfacial boundaries between. . .

DETDESC:

DETD(98)

FIG. . . . structure, a magnetic flux is guided to an element unit 67 by using a magnetic gap formed between a soft **magnetic body** 65 and a soft magnetic yoke 66.

DETDESC:

DETD(99)

. FIG. . . . spin valve unit of the present invention is applied to a perpendicular recording type head. In this structure, a soft **magnetic body** 65 also serves as a primary magnetic pole piece for recording. In some cases, leads may be extended in a. . .

DETDESC:

DETD(100)

In either structure, the soft **magnetic body** 65 is extended backward in order to decrease a demagnetizing field to thereby improve reproducing sensitivity.

DETDESC:

DETD(130)

In . . . of an undercoating film. For example, it is known that although the crystallinity of an NiFe film formed on an **alumina**-sputter film is poor, the crystallinity tends to be oriented in the fcc direction easily if a thin undercoating film consisting. . .

DETDESC:

DETD(137)

A . . . effect element is buried, from a normal material, such as Al.sub.2 O.sub.3 or SiO.sub.2, to a material having a high **thermal conductivity** and suitable for a thin film formation process, such as SiC, Si.sub.3 N.sub.4, or diamond. This increases the reproduction output. . .

DETDESC:

DETD(140)

TABLE 1

Material	**Thermal conductivity** (W/m .multidot. deg) at room temperature
SiO.sub.2	1.4
Al.sub.2 O.sub.3	
SiC	21 to 26
	58.6 to 117. . .

DETDESC:

DETD(240)

FIGS. . . . that the structure shown in FIGS. 83A to 83E is expressed by using Cu atoms 275, atoms 276 of a **magnetic body** consisting of Ni.sub.80 Fe.sub.20, and atoms 277 of a nonmagnetic conductor consisting of, e.g., Cu.

DETDESC:

DETD(243)

Subsequently, as shown in FIG. 83B, a magnetic material such as Ni.sub.80 Fe.sub.20 is vapor-deposited on the undercoating layer. The **magnetic body** atoms 276 that have reached the surface of the substrate 274 move around on the substrate 274 and then reach. . . In the step portion 278, the chemical potential of an atom increases.

Therefore, by properly controlling the energy of the **magnetic body** atoms 276 to be vapor-deposited and the substrate temperature, the vapor-deposited **magnetic body** atoms 276 can no longer leave the step portion 278 and are coated on the step portion 278. When vapor deposition is continued in this state, the **magnetic body** atoms 276 form a layer on the step portion 278. As a result, the magnetic layer is formed.

DETDESC:

DETD(244)

Subsequently, . . . nonmagnetic conductor material such as Cu is vapor-deposited in the same manner as described above before the layer of the **magnetic body** atoms 276 covers the whole undercoating layer. The nonmagnetic conductor atoms 277 form a layer in the same way as. . . layer of the nonmagnetic conductor atoms 277 covers the magnetic layer, the magnetic material is again vapor-deposited to allow the **magnetic body** atoms 276 to form a layer. In this manner, vapor deposition of the magnetic material and vapor deposition of the. . .

US PAT NO: 5,848,579 [IMAGE AVAILABLE] L8: 2 of 8

SUMMARY:

BSUM(7)

These . . . Finally, these constructions result in somewhat poor heat transfer from the valve to the cylinder head due to the poor **thermal conductivity** of the valve seat material and the poor contact area between the insert 24 and the cylinder head 21.

SUMMARY:

BSUM(12)

With . . . is reduced. In addition, the alloy at the interface between the insert ring and the cylinder head also has poor **thermal conductivity** and thus a number of the problems present with pressed in inserts are also present with laser clad inserts.

DETDESC:

DETD(3)

Referring . . . materials are highly desirable for use in engine components and particularly cylinder heads because of their light weight and high **thermal conductivity** and specific, preferred materials will be disclosed later herein.

DETDESC:

DETD(12)

The . . . with an insulating coating 59. Although the insulating coating 59 may be of any material, a ceramic material, such as **alumina**, is preferred. The **alumina** coating 59 is flame sprayed onto the rod base 58 and then is finished by polishing.

DETDESC:

DETD(14)

A . . . formed by a hardened body 63 formed from an appropriate material and which either is magnetized or which carries a **magnetic**

body 64 so as to attract and hold an insert ring 65 thereupon. The body surface 63 is formed with a. . .

US PAT NO: 5,794,337 [IMAGE AVAILABLE] L8: 3 of 8

SUMMARY:

BSUM(7)

These . . . Finally, these constructions result in somewhat poor heat transfer from the valve to the cylinder head due to the poor **thermal conductivity** of the valve seat material and the poor contact area between the insert 24 and the cylinder head 21.

SUMMARY:

BSUM(13)

With . . . is reduced. In addition, the alloy at the interface between the insert ring and the cylinder head also has poor **thermal conductivity** and thus a number of the problems present with pressed in inserts are also present with laser clad inserts.

DETDESC:

DETD(3)

Referring . . . materials are highly desirable for use in engine components and particularly cylinder heads because of their light weight and high **thermal conductivity** and specific, preferred materials will be disclosed later herein.

DETDESC:

DETD(12)

The . . . with an insulating coating 59. Although the insulating coating 59 may be of any material, a ceramic material, such as **alumina**, is preferred. The **alumina** coating 59 is flame sprayed onto the rod base 58 and then is finished by polishing.

DETDESC:

DETD(14)

A . . . formed by a hardened body 63 formed from an appropriate material and which either is magnetized or which carries a **magnetic body** 64 so as to attract and hold an insert ring 65 thereupon. The body surface 63 is formed with a. . .

US PAT NO: 5,778,531 [IMAGE AVAILABLE] L8: 4 of 8

DETDESC:

DETD(11)

FIGS. . . . the melting is substantially eliminated or only occurs over a relatively thin surface area, then no material defects will result, **thermal-conductivity** will be high and the resulting valve seat will be firmly bonded into place. Therefore, in accordance with a facet. . .

DETDESC:

DETD(32)

The . . . with an insulating coating 75. Although the insulating coating 75 may be of any material, a ceramic material, such as **alumina**, is preferred. The **alumina** coating 75 is flame sprayed onto the rod base 74 and then is finished by polishing.

DETDESC:

DETD(34)

A . . . formed by a hardened body 79 formed from an appropriate material and which either is magnetized or which carries a **magnetic body** 81 so as to attract and hold an insert ring 45 thereupon. The body surface 79 is formed with a. . .

US PAT NO: 5,765,520 [IMAGE AVAILABLE] L8: 5 of 8

SUMMARY:

BSUM(7)

These . . . Finally, these constructions result in somewhat poor heat transfer from the valve to the cylinder head due to the poor **thermal conductivity** of the valve seat material and the poor contact area between the insert 24 and the cylinder head 21.

SUMMARY:

BSUM(12)

With . . . is reduced. In addition, the alloy at the interface between the insert ring and the cylinder head also has poor **thermal conductivity** and thus a number of the problems present with pressed in inserts are also present with laser clad inserts.

DETDESC:

DETD(3)

Referring . . . materials are highly desirable for use in engine components and particularly cylinder heads because of their light weight and high **thermal conductivity** and specific, preferred materials will be disclosed later herein.

DETDESC:

DETD(12)

The . . . with an insulating coating 59. Although the insulating coating 59 may be of any material, a ceramic material, such as **alumina**, is preferred. The **alumina** coating 59 is flame sprayed onto the rod base 58 and then is finished by polishing.

DETDESC:

DETD(14)

A . . . formed by a hardened body 63 formed from an appropriate material and which either is magnetized or which carries a **magnetic body** 64 so as to attract and hold an insert ring 65 thereupon. The body surface 63 is formed with a. . .

US PAT NO: 5,761,806 [IMAGE AVAILABLE] L8: 6 of 8

SUMMARY:

BSUM(7)

These . . . Finally, these constructions result in somewhat poor heat transfer from the valve to the cylinder head due to the poor **thermal conductivity** of the valve seat material and the poor contact area between the insert 24 and the cylinder head 21.

SUMMARY:

BSUM(13)

With . . . is reduced. In addition, the alloy at the interface between the insert ring and the cylinder head also has poor **thermal conductivity** and thus a number of the problems present with pressed in inserts are also present with laser clad inserts.

DETDESC:

DETD(3)

Referring . . . materials are highly desirable for use in engine components and particularly cylinder heads because of their light weight and high **thermal conductivity** and specific, preferred materials will be disclosed later herein.

DETDESC:

DETD(12)

The . . . with an insulating coating 59. Although the insulating coating 59 may be of any material, a ceramic material, such as **alumina**, is preferred. The **alumina** coating 59 is flame sprayed onto the rod base 58 and then is finished by polishing.

DETDESC:

DETD(14)

A . . . formed by a hardened body 63 formed from an appropriate material and which either is magnetized or which carries a **magnetic body** 64 so as to attract and hold an insert ring 65 thereupon. The body surface 63 is formed with a. . .

US PAT NO: 5,699,088 [IMAGE AVAILABLE] L8: 7 of 8

SUMMARY:

BSUM(19)

Although . . . resistor 404 provided in relation to conductor portion 403. As a material of substrate 401, a nonmagnetic ceramics such as **alumina** (Al.sub.2 O.sub.3) is generally used. As a material of heat insulating layer 402, glass is generally used. As a material. . .

SUMMARY:

BSUM(43)

As . . . permalloy, Fe-Si alloy, Fe-Co alloy, Fe-Ni-Co alloy, Ni-Co alloy, Mn-Zn ferrite, Ni-Zn ferrite, Mg-Zn ferrite, Mg-Mn ferrite, sendust and amorphous **magnetic body** may be used. As the material of the heat insulating layer, a material having low **thermal conductivity** selected from the group consisting of glass, polyimide, aromatic polyimide and polybenzimidazole may be used. As the material of

the. . .

DETDESC:

DETD(9)

Referring . . . as permalloy, Fe-Si alloy, Fe-Co alloy, Fe-Ni-Co alloy, Ni-Co alloy, Mn-Zn ferrite, Ni-Zn ferrite, Mg-Zn ferrite, Mg-Mn ferrite, sendust, amorphous **magnetic body** may be used.

DETDESC:

DETD(19)

As . . . as permalloy, Fe-Si alloy, Fe-Co alloy, Fe-Ni-Co alloy, Ni-Co alloy, Mn-Zn ferrite, Ni-Zn ferrite, Mg-Zn ferrite, Mg-Mn ferrite, sendust, amorphous **magnetic body** may be used. Preferably, the thickness should be in the range of from about 0.2 mm to about 5.0 mm.

DETDESC:

DETD(20)

As the material of heat insulating layers 32a and 32b, materials having low **thermal conductivity** such as glass, polyimide, aromatic polyimide, polybenzimidazole may be used, and the thickness thereof should preferably be in the range. . .

DETDESC:

DETD(87)

The . . . magnetic printer described in the first embodiment except that a material other than the non-magnetic ceramics such as a common **alumina** is used as the material of the substrate 51a. More specifically, in recording head 50 for a magnetic printer, magnetic. . .

DETDESC:

DETD(92)

A non-magnetic ceramics such as **alumina** may be used as the material of the substrates 51a and 51b as mentioned above, and preferably, the thickness should. . .

DETDESC:

DETD(94)

A . . . as permalloy, Fe-Si alloy, Fe-Co alloy, Fe-Ni-Co alloy, Ni-Co alloy, Mn-Zn ferrite, Ni-Zn ferrite, Mg-Zn ferrite, Mg-Mn ferrite, sendust, amorphous **magnetic body** or the like may be used as the material of the magnetic film layers 58a and 58b. In recording head. . .

CLAIMS:

CLMS(9)

9. . . . recording head for a magnetic printer according to claim 8, wherein
said heat insulating layer includes a material having low **thermal conductivity** selected from the group consisting of glass, polyimide, aromatic polyimide and polybenzimidazole.

. . .. . CLAIMS:

CLMS(13)

13. A recording head for a magnetic printer according to claim 3, wherein
said magnetic substrate includes a soft **magnetic body** selected from the group consisting of permalloy, Fe-Si alloy, Fe-Co alloy, Fe-Ni-Co alloy, Ni-Co alloy, Mn-Zn ferrite, Ni-Zn ferrite, Mg-Zn ferrite, Mg-Mn ferrite, sendust and an amorphous **magnetic body**.

US PAT NO: 3,742,272 [IMAGE AVAILABLE] L8: 8 of 8

SUMMARY:

BSUM(10)

The . . . current change and thus the silicon carbide varistor has a much smaller voltage operating range thereby limiting its applications. The **thermal conductivity** of MOV material is fairly high (approximately one-half that of **alumina**) whereby it has a much higher power handling capability than silicon carbide, and it exhibits a negligible switching time in. . .

DETDESC:

DETD(4)

The . . . current path of the brush when such brush and commutator segment first part upon rotation of the commutator. The high **thermal conductivity** of the MOV material also permits cooler operation of the brushes.

DETDESC:

DETD(5)

The . . . current and result in a high degree of voltage limiting, (2) the response time is negliglble, and (3) the high **thermal conductivity** permits rapid dissipation of heat developed in the commutator-brush spark generating phenomenon. In conventional commutation, upon initial parting of the. . .

DETDESC:

DETD(10)

Having . . . latter case, a brush having a flat bottom surface contacts flattened areas of a conductor or conductors wound on a **magnetic body** and the brush is moved in a circular arc. Our invention thus is broadly directed to improved electric current collection. . .

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FILE 'USPAT' ENTERED AT 15:19:03 ON 12 JUL 1999
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 *          U. S.   P A T E N T   T E X T   F I L E           *
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=> s magnetic body

        268461 MAGNETIC
        673201 BODY
L1        1428 MAGNETIC BODY
                 (MAGNETIC(W)BODY)

=> s L1 ands L1 and binder

MISSING OPERATOR 'L1 ANDS'

=> s L1 and binder

         97982 BINDER
L2          95 L1 AND BINDER

=> s L2 and magnetic powder

        268461 MAGNETIC
        225303 POWDER
          3446 MAGNETIC POWDER
                 (MAGNETIC(W)POWDER)
L3          31 L2 AND MAGNETIC POWDER

=> s L3 and (alumina or aluminum nitride or cubic nitride or silicon carbide)

         96512 ALUMINA
        334933 ALUMINUM
         48746 NITRIDE
          4732 ALUMINUM NITRIDE
                 (ALUMINUM(W)NITRIDE)
         66720 CUBIC
         48746 NITRIDE
            11 CUBIC NITRIDE
                 (CUBIC(W)NITRIDE)
        205015 SILICON
         65543 CARBIDE
         22882 SILICON CARBIDE
                 (SILICON(W)CARBIDE)
L4           7 L3 AND (ALUMINA OR ALUMINUM NITRIDE OR CUBIC NITRIDE OR SIL
ICO
               N CARBIDE)

=> d L4 1-7 kwic


US PAT NO:     5,512,363 [IMAGE AVAILABLE]           L4: 1 of 7
TITLE:         Magnetic recording medium having a magnetic layer
                 containing magnetic powder and an underlayer
                 containing two kinds of non magnetic powder

ABSTRACT:
Disclosed . . . a thickness of less than 0.5 .mu.m, and layers other
than the outermost layer contain two or more kinds of non-magnetic
powder having different average particle sizes.
```

The magnetic recording medium has high durability in running under high temperature and high humidity.

SUMMARY:

BSUM(5)

Incidentally, . . . magnetic recording medium consisting of a magnetic layer and a layer that is provided under the magnetic layer and contains non-**magnetic powder** is disclosed in Japanese Patent Publication Open to Public Inspection No. 187418/1988 (hereinafter referred to as Japanese Patent O.P.I. Publication).

SUMMARY:

BSUM(6)

In . . . gazette, however, it has been difficult to control the surface roughness of a lower layer because only one kind of non-**magnetic powder** is used in the lower layer and a magnetic layer that is an upper layer is comparatively thick and it. . .

SUMMARY:

BSUM(9)

Namely, . . . of the magnetic layer is not more than 0.5 .mu.m, at least one layer other than the outermost layer contains non-**magnetic powder** or high transmission factor substances, and a thickness of a layer containing said non-**magnetic powder** or said substances is not more than 0.5 .mu.m.

DETDESC:

DETD(4)

and radius R.sub.1 of the aforementioned non-**magnetic powder** and thickness T.sub.1 of the layer containing the non-**magnetic powder** satisfy the condition of

DETDESC:

DETD(6)

The . . . a thickness of less than 0.5 .mu.m, and layers other than the outermost layer contain two or more kinds of non-**magnetic powder** having different average particle sizes, the invention described in claim 2 is the magnetic recording medium according to claim 1,. . . magnetic recording medium according to claim 1, wherein a layer adjoining said outermost layer contains two or more kinds of non-**magnetic powder** having different average particle sizes, the invention described in claim 4 is the magnetic recording medium according to claim 1, wherein the outermost layer constitutes together with a plurality of layers and an average particle size of non-**magnetic powder** contained in a layer adjoining the outermost layer is larger than that of non-**magnetic powder** contained in layers other than the layer adjoining the outermost layer, the invention described in claim 5 is the magnetic. . . recording medium according to claim 1, wherein a difference of an average particle size between two or more kinds of non-**magnetic powder** contained in layers other than said outermost layer is not less than 10 m.mu., and the invention described in claim 6 is The magnetic recording medium according to claim 1, wherein non-**magnetic powder** contained in layers other than the outermost layer is composed of non-**magnetic powder** having an average particle size of 10-30 nm and non-**magnetic powder** having an average particle size of not less than 40 nm.

DETDESC:

DETD(8)

The above-mentioned requirement is met by the invention wherein at least one layer other than an outermost layer contains non-**magnetic powder** or highly magnetic-permeable substances A having an average particle size of A.sub.1 (nm) and conductive powder B having an average. . .

DETDESC:

DETD(16)

The . . . lower layer satisfies the above-mentioned inequalities. It is further necessary, for the high density recording, to eliminate additives other than **magnetic powder** from a magnetic layer as far as possible, and to transfer functions to a lower layer. In this connection, it. . .

DETDESC:

DETD(19)

It is possible to further improve calenderbility by making the weight ratio of conductive powder B to non-**magnetic powder** or to highly magnetic-permeable substances A to be 1-20% by weight.

DETDESC:

DETD(20)

It is further possible to improve running durability by making the weight ratio of non-**magnetic powder** or high transmission factor substance A conductive powder B to be 1-20% by weight.

DETDESC:

DETD(21)

The . . . according to claim 1, wherein a lower layer including at least one non-magnetic layer containing two or more kinds of non-**magnetic powder** having different particle sizes and an outermost layer consisting of a magnetic layer containing ferromagnetic powder are laminated in this. . .

DETDESC:

DETD(27)
are satisfied when crystallite sizes of two or more kinds of non-**magnetic powder** having different particle sizes in the non-magnetic layer measured in an X-ray analysis method are L.sub.1, L.sub.2, ... The invention described in claim 12 os a magnetic recording medium according to claim 11 mentioned above wherein at least non-**magnetic powder** having a crystallite size of L.sub.1 is contained, the invention described in claim 13 is a magnetic recording medium according. . .

DETDESC:

DETD(39)

In the invention, an outermost layer is a magnetic layer in which **magnetic powder** is basically dispersed in **binder** resins.

DETDESC:

DETD(40)

The magnetic layer that is an outermost layer contains therein ferromagnetic powder and/or **magnetic powder** of a hexagonal system. A layer thickness of the outermost layer is not more than 0.5 .mu.m and preferably is. . .

DETDESC:

DETD(41)

As ferromagnetic metal powder used for the outermost layer, there may be given ferromagnetic powder such as metallic **magnetic powder** containing primarily Fe, Ni and Co in types of Fe--Al, Fe--Al--Ni, Fe--Al--Zn, Fe--Al--Co, Fe--Al--Ca, Fe--Ni, Fe--Ni--Al, Fe--Ni--Co, Fe--Ni--Si--Al--Mn, Fe--Ni--Si--Al--Zn, Fe--Al--Si,. . .

DETDESC:

DETD(43)

Ferromagnetic metal powder that is preferable in particular for the object of the invention, is metallic **magnetic powder** whose principal ingredient is Fe, and practical examples thereof which are desirable include **magnetic powder** that contains Fe and Al in the range of weight ratio of Fe:Al=100:0.5-100:20 with regard to Al and and **magnetic powder** that contains Fe, Al and Ca in the range of weight ratio of Fe:Al=100:0.5-100:20 with regard to Al and in. . .

DETDESC:

DETD(54)

For a magnetic layer of the magnetic recording medium of the invention, it is possible to use **magnetic powder** of a hexagonal system.

DETDESC:

DETD(55)

As **magnetic powder** of a hexagonal system, ferrite of a hexagonal system, for example, may be cited. Such ferrite of a hexagonal system. . . may be substituted with other elements (for example, Ti, Co, Zn, In, Mn, Ge, Nb etc.). As for the ferrite **magnetic body**, details are described in IEEE Trans.on MAG-18 16 (1982).

DETDESC:

DETD(56)

As **magnetic powder** of a hexagonal system that is especially preferable in the invention, there may be given barium ferrite (hereinafter referred to as Ba-ferrite) **magnetic powder**.

DETDESC:

DETD(57)

Ba-ferrite **magnetic powder** preferably used in the invention consists of Ba-ferrite wherein a part of Fe in the Ba-ferrite powder is substituted with. . .

DETDESC:

DETD(63)

With regard to **magnetic powder** of a hexagonal system used in the invention, it is preferable saturation magnetization amount (.sigma..sub.s) which is a magnetic characteristic of the **magnetic powder** usually is not less than 50 emu/g. When the saturation magnetization amount is less than 50 emu/g, an electromagnetic converting. . .

DETDESC:

DETD(65)

As a method for producing **magnetic powder** of a hexagonal system used in the invention, there may be available a coprecipitation-baking method, a hydrothermal synthesizing method, a. . .

DETDESC:

DETD(67)

Content of ferromagnetic metal powder and/or **magnetic powder** of a hexagonal system in the magnetic layer is usually 50-99% by weight and is preferably 60-99% by weight.

DETDESC:

DETD(69)

At least one layer adjoins the outermost layer. In the layer adjoining the outermost layer, two or more kinds of non-**magnetic powder** having different average particle sizes are contained. Owing to two or more kinds of non-magnetic power having different average particle sizes contained, non-**magnetic powder** having an average particle size of large sizes causes the surface of the layer adjoining the outermost layer to be. . . is, thus an improvement of the running durability of the magnetic recording medium can be achieved. Further, owing to filled non-**magnetic powder** having large and small particle sizes, an amount of filled non-**magnetic powder** can be increased and calenderbility can be improved, which is advantageous.

DETDESC:

DETD(70)

As a method for causing a layer other than the outermost layer to contain two or more kinds of non-**magnetic powder** having different particle sizes, the following optimum embodiments can be given. Namely, there may be given the first embodiment wherein at least one layer other than the outermost layer contains non-**magnetic powder** having an average particle size of large particles and non-**magnetic powder** having an average particle size of small particles, and the second embodiment wherein a layer other than the outermost layer is composed of at least two layers and the layer adjoining the outermost layer contains non-**magnetic powder** having an average particle size of large particles and the layer under the layer adjoining the outermost layer contains non-**magnetic powder** having an average particle size of small particles.

DETDESC:

DETD(71)

In . . . the first and the second embodiments mentioned above, it is desirable that a difference of an average particle size between non-**magnetic powder** having an average particle size of large particles and non-**magnetic powder** having an average particle size of small particles is not less than 10 nm, preferably not less than 30 nm. . . outermost layer which is not more than 0.5 .mu.m, the roughness on the surface of a magnetic layer caused by non-**magnetic powder** having an average particle size of large particles, thereby an improvement in running durability under high temperature and high humidity. . .

DETDESC:

DETD(72)

Though there is no limitation in particular for the average particle size of non-**magnetic powder** having an average particle size of large particles as far as it has the above-mentioned difference of particle size against non-**magnetic powder** having an average particle size of small particles, the average particle size is usually 40 nm or more. Further, though there is no limitation in particular for the average particle size of non-**magnetic powder** having an average particle size of small particles as far as it has the above-mentioned difference of particle size against non-**magnetic powder** having an average particle size of large particles, the average particle size is usually 10-30 nm.

DETDESC:

DETD(73)

Incidentally, a layer containing non-**magnetic powder** other than a magnetic layer that is an outermost layer functions as a layer for supplying lubricant to the magnetic. . . that a layer under the magnetic layer functions fully as a lubricant-supplying layer, it is preferable that oil content of non-**magnetic powder** contained in a layer under the magnetic layer is low as far as possible, and it is usually not more. . .

DETDESC:

DETD(74)

As non-**magnetic powder** in the invention, those having the aforementioned characteristics may be used after being selected properly from various known non-**magnetic powder** used for magnetic recording media of this kind. The non-**magnetic powder** includes, for example, carbon black, graphite, titanium oxide, barium sulfide, ZnS, MgCO.sub.3, CaCO.sub.3, ZnO, CaO, .gamma.-iron oxide, tungsten disulfide, molybdenum. . . SiO.sub.2, Cr.sub.2 O.sub.3, .alpha.-Al.sub.2 O.sub.3, SiC, cerium oxide, corundum, artificial diamond, .alpha.-iron oxide, garnet, silicon dioxide, silicon nitride, boron nitride, **silicon carbide**, molybdenum carbide, boron carbide, tungsten carbide, titanium carbide, tripoly, diatomaceous earth, and dolomite.

DETDESC:

DETD(75)

Those especially preferable among non-**magnetic powder** mentioned above include inorganic powder such as carbon black, CaCo.sub.3, titanium oxide, barium sulfide, .gamma.-iron oxide, .alpha.-Al.sub.2 O.sub.3, and .alpha.-iron. . .

DETDESC:

DETD(83)

BINDER

DETDESC:

DETD(84)

With regard to a **binder** used for forming a magnetic layer that is an outermost layer and a layer other than the magnetic layer, vinyl chloride resins such as, for example, polyurethane, polyester and vinyl chloride copolymer are typical as a **binder** used for the invention. It is preferable that these resins contain a repeating unit having at least one kind of. . .

DETDESC:

DETD(114)

In the invention, following resins may be used as a **binder** provided that an amount of the resin used is 20% by weight of all binders used.

DETDESC:

DETD(128)

Next, concrete examples of the abrasives include .alpha.-**alumina**, fused **alumina**, chromium oxide, titanium oxide, .alpha.-iron oxide, silicon oxide, silicon nitride, tungsten carbide, molybdenum carbide, boron carbide, corundum, zinc oxide, cerium. . .

DETDESC:

DETD(137)

Among the aforementioned kneaders for dispersion, those capable of providing power consumption load of 0.05-0.5 kw (per 1 kg of **magnetic powder**) are a pressure kneader, an open kneader, a continuous kneader, a twin roll mill and a tripple roll mill.

DETDESC:

DETD(160)

Alumina (.alpha.-Al.sub.2 O.sub.3, average particle size;0.2 .mu.m) . . . 6 parts

DETDESC:

DETD(263)

Alumina (.alpha.-Al.sub.2 O.sub.3, average particle size; 0.2 .mu.m) . . . 6 parts

DETDESC:

DETD(276)

Alumina (.alpha.-Al.sub.2 O.sub.3, average particle size: 0.2 .mu.m) . . . 6 parts

DETDESC:

DETD(328)

.alpha.-**Alumina** (average particle size; 0.1 .mu.m) . . . 5 parts

DETDESC:

DETD(377)

.alpha.-**Alumina** (particle size; 0.1 .mu.m) . . . 5 parts

DETDESC:

DETD(387)

Magnetic . . . in the same manner as that for the aforementioned magnetic coating A for an outermost layer except that barium ferrite **magnetic powder** (coercive force Hc=1200 Oe, BET value 40 m.sup.2 /g, average tabular ratio=3.5, .sigma.s=65 emu/g) was used in place of 100 parts of Fe--Al **magnetic powder** in the magnetic coating A for an outermost layer.

DETDESC:

DETD(388)

[Coating a For A Non-**magnetic Powder**-containing Layer]

DETDESC:

DETD(396)

[Coating b For A Non-**magnetic Powder**-containing Layer]

DETDESC:

DETD(397)

Coating b for a non-**magnetic powder**-containing layer was prepared in the same manner as that for the aforesaid coating a for a non-**magnetic powder**-containing layer except that 100 parts of titanium oxide (2) (TiO.sub.2, particle size 0.03 .mu.m) were used in place of 100 parts of titanium oxide (1) in the aforementioned coating a for a non-**magnetic powder**-containing layer.

DETDESC:

DETD(399)

Coating . . . a high permeability material-containing layer was prepared in the same manner as that for the aforementioned coating a for a non-**magnetic powder**-containing layer except that 100 parts of Fe--Si--Al Sendust alloy powder [Hc=40 (A/m), .mu.i=200 (H/m), particle size 0.1 .mu.m] were used in place of 100 parts of titanium oxide (1) in the above-mentioned coating a for a non-**magnetic powder**-containing layer.

DETDESC:

DETD(401)

Coating . . . a high permeability material-containing layer was prepared in the same manner as that for the aforementioned coating a for a non-**magnetic powder**-containing layer except that 100 parts of Mn--Zn ferrite [composition of MnO: 18% by weight, ZnO: 14% by weight and Fe.sub.2. . . 0.1 .mu.m] were used in place of 100 parts of titanium oxide (1) in the above-mentioned coating a for a non-**magnetic**

powder-containing layer.

CLAIMS:

CLMS(1)

What is claimed is:

1. A magnetic recording medium comprising:
a non-magnetic support;
an outermost magnetic layer containing a first **binder** and at least one powder selected from the group consisting of ferromagnetic metal powder and hexagonal ferrite powder, said outermost. . . layer having a thickness of less than 0.5 .mu.m; and
an inner layer, adjacent to said outermost layer, containing a second **binder**, a first non-**magnetic powder** having a first average particle size of 10 to 30 nm, and a second non-**magnetic powder** having a second average particle size of not less than 40 nm.

CLAIMS:

CLMS(2)

2. The magnetic recording medium of claim 1 wherein a difference in average particle size between said first non-**magnetic powder** and said second non-**magnetic powder** is not less than 10 nm.

US PAT NO: 5,188,907 [IMAGE AVAILABLE] L4: 2 of 7

SUMMARY:

BSUM(4)

Generally, . . . magnetic recording medium such as a magnetic tape is prepared by coating on a support a magnetic paint comprising a **magnetic powder** and a **binder** and drying it. In a conventional magnetic recording medium having a single layer, a broad frequency range from low to. . . where a lower noise and a higher recording performance in a high frequency range are required, there is used a **magnetic powder** having a high Hc and a high BET value. And in a single-layered recording medium, a chroma and audio output. . .

SUMMARY:

BSUM(5)

However, a magnetic recording medium having a single magnetic layer, or a single **magnetic powder**, tends to be forced to use a **magnetic powder** with a high Hc and high BET value for higher properties in a high frequency range, thereby properties in a. . .

DETDESC:

DETD(10)

These . . . medium of said magnetic permeability, it is related by these expressions to an Hc fluctuation owing to composition of the **magnetic body** or a crystal defect in the **magnetic body** such as cavities. When a magnetic layer is regarded to be such a medium, it is connected to an Hc. . .

DETDESC:

DETD(12)

' Experiments . . . larger BET value gives a larger SFD. The term "BET value" used here means a specific surface area of a **magnetic powder** and indicates a surface area measured by a measuring method of a specific surface area called the BET method, in square meters per a unit gram of a **magnetic body**. The specific surface area and a measuring method thereof are explained in detail in "Fine Particle Measurement" by J.M. Dallavalle. . .

DETDESC:

DETD(13)

Switching Field Distribution (SFD) is described below. The magnetic properties of **magnetic powder** and magnetic tapes include coercive force Hc and magnetic flux density B. Hc is the value for H obtained when. . .

DETDESC:

DETD(14)

It . . . that the Hc of the tape in question is the average value of Hc for the individual particles of the **magnetic powder** dispersed in the magnetic layer. Moreover, even if the individual particles of the **magnetic powder** have a particular value of Hc, the position of cache particle in the magnetic layer varies depending upon the dispersion,. . . this difference in position and orientation can result in a difference in the Hc of the individual particles of the **magnetic powder** and the tape.

DETDESC:

DETD(15)

The Hc of a tape is obtained as the average value for individual particles of the **magnetic powder** in the magnetic layer. The SFD value serves as an index of the degree of variance of the Hc in. . . eve when different tapes have an equivalent Hc value, they can have different SFD values according to the differences in **magnetic powder** properties and video tape production conditions.

DETDESC:

DETD(27)

In the present invention, the above SFDs of respective magnetic layers can be attained by selecting the SFD of a **magnetic powder** and controlling the dispersing time in a dispersing means such as a ball mill.

DETDESC:

DETD(33)

The magnetic layers 2, 2a, 2b and 4 contain a **magnetic powder**. Examples of such magnetic powders include iron oxide magnetic powders such as .gamma.-Fe.sub.2 O.sub.3, Co-containing .gamma.-Fe.sub.2 O.sub.3, Fe.sub.3 O.sub.4, Co-containing. . .

DETDESC:

DETD(34)

Among . . . be selected. For example, a high output recording medium can be prepared by using in the uppermost layer 4 a **magnetic**

powder having a coercive force (Hc) higher than that used in the lower layer 2.

DETDESC:

DETD(35)

There . . . acid, a fatty ester having 13 to 40 carbon atoms; a dispersant such as lecithin; a abrasive such as fused **alumina**; and an antistatic agent such as carbon black.

DETDESC:

DETD(37)

These . . . as lithium, potassium, sodium, or a hydrocarbon residue. These hydrophilic polar groups enhance the compatibility of the resins with the **magnetic powder**, and thereby the dispersibility of the **magnetic powder** is further improved and the aggregation of the **magnetic powder** can be prevented. This increases the stability of a magnetic paint and leads to the improvement of durability of the. . .

DETDESC:

DETD(39)

The backcoat layer 3 is formed by coating on the reverse side of the support the above-mentioned **binder** to which carbon black and, if necessary, non-magnetic particles such as barium sulfate are incorporated.

DETDESC:

DETD(40)

As . . . plastics such as polyethylene terephthalate and polypropylene; metals such as Al and Zn; and ceramics such as glass, boron nitride, **silicon carbide**, porcelain and china are used.

DETDESC:

DETD(49)

Examples 1 through 6 and Comparative examples 1 through 4 were prepared using various kind of **magnetic powder** which were different in the SFD value from each other.

DETDESC:

DETD(50)

Magnetic paints for the lower magnetic layer		
Magnetic powder	100	parts
Kind of magnetic material, Hc and SFD are shown in Table 1		
.alpha.-Al.sub.2 O.sub.3	5.0	parts
Metal sulfonate-containing. . .	1.0	part
Methyl ethyl ketone	200	parts
Toluene	200	parts
Cyclohexanone	100	parts
Magnetic paints for the upper magnetic layer		
Magnetic powder	100	parts
Kind of magnetic material, Hc and SFD are shown in Table 1		

.alpha.-Al.sub.2 O.sub.3 5.0 parts
Metal-sulfonate-containing polyvinyl. . .

DETDESC:

DETD(55)

TABLE 1

Upper Layer
Magnetic powder Dis-
Fe.sup.2+ /
persing
Composi-
Fe.sup.3+ time
tion. . .

Lower Layer
Magnetic powder Dis-
Fe.sup.2+ / persing
Composi-
Fe.sup.3+ time

DETDESC:

DETD(59)
. . .
2

Magnetic paint for the
Magnetic paint for the
lowermost magnetic layer
intermediate magnetic layer
Magnetic powder
Dispersing
Magnetic powder
Dispersing
Hc Fe.sup.2+ /Fe.sup.3+
time Hc Fe.sup.2+ /Fe.sup.3+
time
(Oe)
(%) SFDp
(min.). . .
Video tape
uppermost magnetic layer
SDF of the
SFD of the
SFD of the
Magnetic powder
Dispersing
lowermost
intermediate
uppermost
Hc Fe.sup.2+ /Fe.sup.3+
time magnet
magnet magnet
(Oe). . .

DETDESC:

DETD(65)

The SFDp value measured by the following method was defined as the SFD value of a **magnetic powder** itself. One hundred parts by weight of the **magnetic powder** to be measured was dispersed in 20 parts by weight of polyurethane **binder** using a proper solvent and coated on a base film and dried so as to form a layer having thickness. . .

ABSTRACT:
A . . . into two throughholes by disposing therein a non-magnetic partitioning member having a thermal expansion coefficient close to that of the **magnetic body** within a region of 15%. In this way, the two throughholes behave magnetically as if the starting extremity and the. . .

SUMMARY:

BSUM(34)

In . . . transformer a pair of throughholes are disposed in the thickness direction of a soft ferrite body therein, which is a **magnetic body** constituting the cores, a linking slit linking the pair of throughholes so that they behave magnetically as if they were. . . that the starting and the ending extremity of a conductor acting as a coil formed on the surface of the **magnetic body** constituting the core are led to the rear side of the **magnetic body** described above through the throughholes linked as described above, respectively, to effect necessary connections.

SUMMARY:

BSUM(35)

Further, . . . the cross sectional shape of the throughholes disposed in the thickness direction of the soft ferrite body, which is the **magnetic body** constituting the core, is rectangular or at least one side of the cross sectional shape is linear.

SUMMARY:

BSUM(37)

Still . . . a stator core of the rotary transformer described above a hole is formed in the thickness direction of a disc-shaped **magnetic body** constituting the core therein, at the central portion of which a dividing plate made of a non-magnetic substance having a. . . and the starting and the ending extremity of a conductor acting as a coil formed on the surface of the **magnetic body** constituting the core are led to the rear side of the **magnetic body** described above through the small holes, respectively, to effect necessary connections.

SUMMARY:

BSUM(38)

Still . . . magnetic head device described previously two holes independent from each other are formed in the thickness direction of a disc-shaped **magnetic body** constituting the rotary transformer therein, and in order that the size of the depth of the holes is smaller than. . . the starting and the ending extremity of a conductor acting as a coil formed on the surface of the disc-shaped **magnetic body** constituting the core are led to the rear side of the disc-shaped **magnetic body** described above through the different throughholes, respectively, to effect necessary connections, recess portions are formed at the places corresponding to the positions of the holes on the rear side of the disc-shaped **magnetic body** described above. That is, when the size of the depth of the holes is smaller than 1 mm, magnetic field. . .

SUMMARY:

BSUM(39)

Still . . . and a rotary transformer used therefor according to the present invention, in the third rotary magnetic head device the disc-shaped **magnetic body** described above is reinforced by disposing reinforcing materials made of a non-magnetic substance having a thermal expansion coefficient, which is. . . the recess portions formed at the places corresponding to the positions of holes on the rear side of the disc-shaped **magnetic body** described above.

SUMMARY:

BSUM(40)

Still . . . in the third and the fourth rotary magnetic head device described previously according to the present invention, for the disc-shaped **magnetic body** described above, in which the nonmagnetic materials are disposed in a space excavated or formed therein, the **magnetic body** portion and the non-magnetic material portions are formed simultaneously in one body by the injection molding.

SUMMARY:

BSUM(46)

The presence of a **magnetic body** having a high permeability in the conductor path contributes to the stray L component. However, for a lead portion corresponding. . .

SUMMARY:

BSUM(48)

For . . . therefore it is possible to reduce remarkably influences of the lead of a length corresponding to the thickness of the **magnetic body** (length the of the throughhole) on the leakage inductance.

SUMMARY:

BSUM(49)

In . . . thus it is possible to reduce remarkably influences of the lead of a length corresponding to the thickness of the **magnetic body** (length the of the throughhole) on the leakage inductance. According to the present invention, owing to the fact that the. . .

DETDESC:

DETD(41)

Raw . . . position in a mold for forming the rotor core. Thereafter raw material for forming the magnetic core, prepared by adding **binder** to soft ferrite **magnetic powder**, is injected in the mold stated above to fabricate a crude core body having the coil grooves. This crude core. . .

DETDESC:

DETD(42)

As . . . as described previously. If the partitioning member is made of a ceramic material, whose main raw material is silica or **alumina**, it can have a difference in the thermal expansion coefficient in a region of 15%.

DETDESC:

DETD(61)

For . . . is made of Ni--Zn or Mg--Zn ferrite, it is suitable to use a ceramic material made principally of silica or **alumina** for the non-magnetic reinforcing member. In this case, even if the non-magnetic reinforcing member is formed and sintered at the. . .

US PAT NO: 5,073,406 [IMAGE AVAILABLE] L4: 4 of 7

ABSTRACT:
A method of producing a magnetic recording medium comprises the steps of kneading and dispersing ferromagnetic powder, **binder** and non-ferromagnetic powder to obtain magnetic coating solutions, and applying a plurality of the magnetic coating solutions on a non-ferromagnetic. . .

SUMMARY:

BSUM(6)

Further, . . . of a video tape and to increase the residual magnetic flux density. It is also known to finely divide the **magnetic powder** to be kneaded for the same purpose.

SUMMARY:

BSUM(8)

The magnetic layer is prepared by kneading an organic solvent containing **magnetic powder** and a **binder** to form a magnetic coating material and applying the magnetic coating material on a substrate. At the time of kneading,. . .

SUMMARY:

BSUM(9)

Therefore, . . . two layers, wherein the magnetic coating material used for the lower layer is made by kneading an organic solvent containing **magnetic powder** and a **binder** with a kneader of low shear force, and then dispersing it in a wet medium dispersion mixer, and the magnetic. . .

SUMMARY:

BSUM(10)

In . . . structured magnetic recording layer, the lower layer is desired to have as high a filling rate as possible using a **magnetic body** of high magnetization rate so as to be suited for long wavelength recording having a large recording depth; and the. . . magnetic layer is smoothed and lowers the sliding performance while it improves the electromagnetic conversion characteristics. Further, the finely divided **magnetic body** is likely to be deformed in the course of kneading to lower the magnetic characteristics. That is, both the upper. . .

SUMMARY:

BSUM(14)

The . . . producing a magnetic recording medium in accordance with the present invention comprises the steps of kneading and dispersing

ferromagnetic powder, **binder** and non-ferromagnetic powder, and applying a plurality of magnetic coating solutions on a non-ferromagnetic substrate to form a plurality of. . .

SUMMARY:

BSUM(21)

5) A method of producing a magnetic recording medium in which the **binder** used in each of the upper and lower layer coating solutions comprises a vinyl chloride vinyl acetate copolymer and polyester polyurethane, and the total amount of the **binder** used is 15-30 wt % relative to the ferromagnetic fine particles. Polyisocyanate compounds may be added to each of the. . .

DETDESC:

DETD(14)

The **binder** used in the practice of the present invention may be any of conventional thermoplastic resins, thermosetting resins, reactive resins and. . .

DETDESC:

DETD(22)

In . . . N.sup.+ R.sup.3 wherein R is a hydrocarbon radical, epoxy radical, SH, CN and the like is preferably introduced in the **binder** by copolymerization or addition. The amount of the polar radicals present in the **binder** is 10.sup.-1 -10.sup.-8 mole/g, and preferably 10.sup.-2 -10.sup.-6 mole/g.

DETDESC:

DETD(23)

The examples of the **binder**, which can be used in the present invention, include VAGH, VYHH, VMCH, VAGF, VAGD, VROH, VYES, VYNC, VMCC, XYHL, XYSG,. . .

DETDESC:

DETD(24)

In the present invention, the **binder** is used in an amount of 5-50%, and preferably 10-30%, relative to the magnetic material in each of the first. . .

DETDESC:

DETD(26)

The magnetic recording medium used in the present invention comprises two layers Therefore, the respective amounts of the **binder**, vinyl chloride resin, polyurethane resin, polyisocyanate or the other resins present in the **binder**, and the molecular weight, the amount of the polar radicals and the aforementioned physical properties of each of the resins. . .

DETDESC:

DETD(31)

The . . . portion of the surface of the carbon black may be grafted. Further, the carbon black may be dispersed with the **binder** prior to

adding to the magnetic coating.

DETDESC:

DETD(34)

The abrasive, which can be used in the present invention, includes .alpha.-**alumina** which contains 90% or more of .alpha.-type **alumina**, .beta.-**alumina**, **silicon carbide**, chrome oxide, potassium oxide, .alpha.-iron oxide, corundum, artificial diamond, silicon nitride, **silicon carbide** titanium carbide, titanium oxide, silicon dioxide, and boron nitride, each of which has a Mohs hardness of 6 or more.. . .

DETDESC:

DETD(38)

The abrasive may be added to the magnetic coating after it has been dispersed with the **binder**.

CLAIMS:

CLMS(1)

We claim:

1. A method of producing a magnetic recording medium comprising steps of kneading and dispersing ferromagnetic powder, **binder** and non-ferromagnetic powder to obtain magnetic coating solutions, and applying a plurality of the magnetic coating solutions on a non-ferromagnetic. . .

CLAIMS:

CLMS(6)

6. A method of producing a magnetic recording medium as defined in claim 1 wherein the **binder** used in each of the first and second magnetic coating solutions comprises a vinyl chloride vinyl acetate copolymer and polyester polyurethane, and the total amount of the **binder** used is 15-30 wt % relative to the ferromagnetic powder.

US PAT NO: 5,026,438 [IMAGE AVAILABLE] L4: 5 of 7

SUMMARY:

BSUM(1)

This . . . make magnets with a high degree of magnetic anisotropy. The aligned particles can be readily bonded together with a suitable **binder** or hot pressed to full density.

SUMMARY:

BSUM(6)

When . . . any appreciable coercivity. Workers have attempted to pulverize such anisotropic permanent magnets in order to obtain a coercive anisotropic permanently **magnetic powder**. Unfortunately, however, pulverization of the permanent magnet bodies yields a powder that has little coercivity.

SUMMARY:

BSUM(8)

While . . . is the principal object of this invention to create like bonded magnets as well as fully dense hot pressed (i.e., **binder**-free) magnets from such magnetically anisotropic particles without application of a magnetic field in the particle consolidation step.

SUMMARY:

BSUM(12)

Such . . . of a minute or so and hot pressed to full density, the resultant body is a permanent magnet. Further, the **magnetic body** slightly magnetically anisotropic. If the particulate material has been held at the hot pressing temperature for a suitable period of. . .

DETDESC:

DETD(2)

In . . . a uniform molten composition. While under such atmosphere and at a pressure of 2-3 psig, it was transferred into an **alumina** tundish and ejected down through a ceramic nozzle with a 0.6 mm orifice onto the perimeter of an 18 inch. . .

DETDESC:

DETD(17)

In . . . g/cc, which is nearly achieved when the particles are bonded together by hot pressing in the absence of a polymeric **binder**.

CLAIMS:

CLMS(2)

2. The method of claim 1 including a step of mixing the particles with a polymeric **binder** prior to the application of said pressure.

CLAIMS:

CLMS(8)

8. The method of claim 5 including a step of mixing the particles with a polymeric **binder** prior to the application of said pressure.

CLAIMS:

CLMS(11)

11. The method according to claim 10 including a step of mixing said platelets with a polymeric **binder** prior to the application of said pressure.

CLAIMS:

CLMS(12)

12. The method according to claim 11 wherein said **binder** comprises a heat curable, dry epoxy resin.

US PAT NO: 4,808,326 [IMAGE AVAILABLE] L4: 6 of 7

SUMMARY:

BSUM(2)

The . . . for producing a magnetic molding from the magnetic composition, and more particularly to a resin-bonded magnetic composition prepared by bonding **magnetic powder** with synthetic resin, which enables molding of materials of complicated form at low temperatures, and further which improves heat resistance,. . .

SUMMARY:

BSUM(11)

Examples of the above-mentioned ferromagnetic powder are, for instance, ferrite powder, iron powder, Co-compound powder such as borocube, permalloy powder, alnico **magnetic powder**, neodymium **magnetic powder**, amorphous **magnetic powder**, and the like. These powders may be employed alone or in admixture thereof. Among them, since ferrite powder is excellent. . .

SUMMARY:

BSUM(17)

As . . . composition has not yet satisfied the requirements for practical uses in various technical fields. Generally, synthetic resin used as a **binder** of the magnetic composition is unsuitable since the kinds of the synthetic resin are limited in accordance with their characteristics. . .

SUMMARY:

BSUM(19)

The mechanical strength of the magnetic composition, in case that a resin is applied as a **binder** of ferromagnetic powder such as ferrite powder, is as follows.

SUMMARY:

BSUM(20)

Generally . . . case of employing epoxy resin which is most excellent in adhesive strength with other materials of all resins as a **binder** of the ferromagnetic powder, it is very difficult to produce a molding having excellent mechanical strength since strong chemical bonds. . .

SUMMARY:

BSUM(28)

Therefore, . . . the present invention as a magnetic core for a transformer or for high-frequency welding of a laminated tube, since a **magnetic body** which can transfer with high efficiency a magnetic wave having few loss in the range of a low-frequency (several 10. . .

DETDESC:

DETD(4)

(1) . . . ZnO powder and 15 mole % of NiO powder were dispersed and mixed together sufficiently in an automatic mortar of **alumina**. After the mixed powder was baked at 1300.degree. to 1400.degree. C. for two hours, the mixed powder was finely ground (to at most 300 mesh) with the automatic mortar of **alumina** and a stamp mill to give ferrite powder used in experiments (hereinafter referred to as A).

DETDESC:

DETD(7)

Then after the prescribed amounts of A, B and C were dispersed and mixed together sufficiently with an automatic mortar of **alumina**, the mixture was molded and cured to a desired form by hot-pressing.

DETDESC:

DETD(13)

(1) Marketed ion powder, borocube powder (CO-compound powder), permalloy powder, amorphous **magnetic powder**, alnico **magnetic powder** and neodymium **magnetic powder** were finely powdered again (to at most 300 mesh) to give **magnetic powder** used in the experiments (hereinafter referred to as A').

DETDESC:

DETD(15)

(3) As a **binder**, Kerimid 601 produced by Nippon Polyimide Co., Ltd. was used (hereinafter referred to as C).

DETDESC:

DETD(26)

. . .

17.5	"	"							
	powder 92.9								
14	Alnico magnetic **powder** 92.9	0.1	7	200	2	4.3	Residual **magnetic** flux density 700 G	"	"
15	Neodymium magnetic **powder** 92.9	0.1	7	200	2	6.6	Residual **magnetic** flux density 700 G	"	"

CLAIMS:

CLMS(2)

2. . . . is at least one powder selected from the group consisting of ferrite powder, iron powder, Co-compound powder, permalloy powder, alnico **magnetic powder**, neodymium **magnetic powder** and amorphous **magnetic powder**.

US PAT NO: 4,543,208 [IMAGE AVAILABLE] L4: 7 of 7

ABSTRACT:

Disclosed is an magnetic core comprising a molded product made of an iron powder and/or an iron alloy **magnetic powder** having a mean particle size of 10 to 100 .mu.m, and 1.5 to 40%, as a total amount in terms of volume ratio, of an insulating **binder** resin and an

. insulating inorganic compound powder. Also disclosed is a useful method of producing the magnetic core.

SUMMARY:

BSUM(11)

On the other hand, there is employed as a magnetic core material, a compressed powdery **magnetic body** called a dust core, as described in detail in, for example, Japanese Pat. No. 112235. However, such dust cores generally. . .

SUMMARY:

BSUM(15)

The magnetic core of this invention is a molded product comprising a **magnetic powder**, a **binder** resin and an inorganic compound powder. More specifically, the magnetic core of the present invention comprises a molded product of either one or both of an iron powder and an iron alloy **magnetic powder** having a mean particle size of 10 to 100 .mu.m, and 1.5 to 40%, as a total amount in terms of volume ratio, of insulating **binder** resin and insulating inorganic compound powder.

DETDESC:

DETD(2)

The **magnetic powder** of iron and/or an iron alloy to be used in this invention is required to have a mean particle size of 100.mu. or less. This is because the aforesaid **magnetic powder** has a resistivity of 10 .mu..OMEGA..multidot.cm to some ten .mu..OMEGA..multidot.cm at the highest, and therefore in order to obtain sufficient magnetic core material characteristics even in an alternating current containing high frequencies yielding skin effect, the **magnetic powder** must be made into minute particles, thereby to have the particles from their surfaces to inner portions contribute sufficiently to. . . lowering of magnetic flux density. Consequently, in the present invention, the mean particle size of iron powder or iron alloy **magnetic powder** is set within the range from 10 .mu.m to 100 .mu.m.

DETDESC:

DETD(4)

The iron powder or iron alloy **magnetic powder** is not particularly limited, but any desired powder may be available, so long as it can satisfy the various parameters. . .

DETDESC:

DETD(5)

The insulating **binder** resin to be used in this invention has the function of a **binder** to bind the particles of the aforesaid iron powder or iron alloy **magnetic powder**, simultaneously with insulation of the particles of the iron powder or iron alloy **magnetic powder** from each other by coating of the surfaces thereof, thereby imparting sufficient effective resistivity value for alternating current magnetization to the magnetic core as a whole. As such **binder** resins, there may be included various thermosetting and thermoplastic resins such as epoxy resins, polyamide resins, polyimide resins, polyester resins,. . .

DETDESC:

DETD(6)

On . . . to the magnetic core as a whole by existing among the particles of the iron conductive powder or iron alloy **magnetic powder**, simultaneously with enhancement of molding density of the magnetic core through reduction of frictional resistance between the particles of the iron powder or iron alloy **magnetic powder** during molding of the magnetic core. As such inorganic compounds, there may be included calcium carbonate, silica, magnesia, **alumina**, hematite, mica, various glasses or a suitable combination thereof. Of course, these inorganic compounds are required to be not reactive with the above-mentioned iron powder or iron alloy **magnetic powder** and the **binder** resin.

DETDESC:

DETD(7)

As . . . compound powder, it is preferably 1/5 or less of the mean particle size of the iron powder or iron alloy **magnetic powder**, (namely, it is 20 .mu.m or less) in view of its dispersibility as well as the relation to the characteristics. . .

DETDESC:

DETD(8)

In the magnetic core of this invention, the total amount of the **binder** resin and the inorganic compound powder, relative to the whole volume, should be set at the range of from 1.5. . .

DETDESC:

DETD(9)

To mention the volume ratio mutually between the **binder** resin and the inorganic compound powder, the ratio of the former to the latter may be 98 to 20 vol.. . .

DETDESC:

DETD(10)

The . . . be produced, for example, as follows. That is, predetermined amounts of the three components of (i) iron powder, iron alloy **magnetic powder** or a mixture thereof, (ii) **binder** resin and (iii) inorganic compound powder are sufficiently mixed by a mixer and the resultant mixture is then compression molded. . . a temperature of about 30.degree. to 300.degree. C. may also be applied on the molded product for curing of the **binder** resin.

DETDESC:

DETD(11)

Alternatively, as a preferred embodiment of the method, the above steps for mixing the iron powder and/or the iron alloy **magnetic powder** may be carried out by first mixing the insulating inorganic compound powder with the resin to prepare a powdery product which is used as a powdery **binder**, and then mixing the powdery **binder** with the iron powder and/or the iron alloy **magnetic powder**. Therafter the compression molding and the optional heat treatment may be carried out to produce the magnetic core.

DETDESC:

DETD(12)

Accordingly, . . . above preferred embodiment, the method of producing a magnetic core according to this invention comprises a step of preparing a **binder** by mixing an insulating inorganic compound powder with a resin, a step of grinding said **binder** into a powder to prepare a powdery **binder**, and a step of mixing and compression molding said powdery **binder** with iron powder, iron alloy **magnetic powder** or a mixture thereof.

DETDESC:

DETD(13)

According to this method, the powdery **binder** is held homogeneously among the particles of the **magnetic powder** when the powdery **binder** is mixed with the **magnetic powder** of iron or iron alloy magnetic material. When the mixture is further compression molded, the inorganic compound power, having been homogeneously compounded in the powdery **binder**, plays the role of a carrier for introducing the resin into the spaces formed among the particles, whereby the resin is very homogeneously dispersed among the particles of the **magnetic powder**. As a result, a thin insulating layer can be surely formed among the particles and therefore it becomes possible to. . .

DETDESC:

DETD(14)

Moreover, the inorganic compound powder and the resin which have been effectively held among the particles of the **magnetic powder** may decrease the frictional resistance between the particles, whereby it becomes possible to enhance the space factor of the particles of the **magnetic powder** even under molding pressure of not more than 1000 MPa, peferably 100 to 1000 MPa, which is readily utilizable in. . .

DETDESC:

DETD(17)

Various kinds of **magnetic powder** and inorganic powder, having different mean particle sizes, and **binder** resins were formulated at the ratios (vol. %) indicated in Table 1, and these were sufficiently mixed. Each of the. . . under various prescribed pressures to a desired shape. The molded product was subjected to heat treatment for curing of the **binder** resin to provide a magnetic core.

DETDESC:

DETD(19)

For . . . outside this invention (Comparative examples 1 and 2), those containing no inorganic compound powder (Comparative example 3) and those using **magnetic powder** of mean paticle sizes outside this invention (Comparative examples 4 and 5).

DETDESC:

DETD(21)

TABLE 1

Components formulated
Magnetic powder Inorganic compound powder
Binder resin
Mean Formulated Mean Formulated Formulated
particle
ratio particle
ratio ratio
Kind size (.mu.m)
. . . " 12.0 " 8.0
4 " " 65.0 " " 20.0 " 15.0
5 Fe--4.5 Si
53-63
75.0 **Alumina**
5.7 5.0 Epoxy 20.0
6 Fe 44.7 98.4 Silica
0.17
0.1 Polyamide
1.5
7 " 100. . .

DETDESC:

DETD(25)

Mixtures . . . powders or iron alloy magnetic powders having different resistivities (.rho.) and mean particle sizes (D), 1 vol. % of an **alumina** powder having a mean particle size of 1 .mu.m or less and 15 vol. % of an epoxy resin were. . .

DETDESC:

DETD(32)

Inorganic . . . 3 .mu.m was mixed into a solution of thermosetting resin of epoxy resin with the addition of an amine type **binder**, 4,4'-diaminodiphenylmethane (DDM) or m-phenylenediamine (MPD), which were kneaded under heating at 60.degree. C. to 110.degree. C. to prepare a **binder** comprising a mixture of the SiO.sub.2 powder and the epoxy resin. According to this procedure, prepared were 6 kinds of. . .

DETDESC:

DETD(35)

Thereafter, . . . as shown in FIG. 3. In FIG. 3, abscissa is the ratios of the content of silica powder in the **binder** resin; the mark .DELTA. denotes a result of a comparative example where no silica powder is contained at all in the **binder** resin.

DETDESC:

DETD(36)

As is apparent from FIG. 3, the higher the ratio of silica powder in the **binder** resin, the greater the improvement in the magnetic flux density. This is because the frictional resistance between the particles of the **magnetic powder** decreases owing to the rolling action of the silica powder and the presence of the resin dispersed among the particles of the **magnetic powder** and, as a result, the space factor of the Fe-1.8%Si alloy powder in the magnetic core has been improved. Moreover,. . .

DETDESC:

DETD(38)

An . . . volume % relative to the resin, and the mixture was subjected to cooling processing and extrusion processing to prepare a **binder** solid form, which was then milled or ground to obtain a powdery **binder** having a particle size of 74 .mu.m or less.

DETDESC:

DETD(39)

The powdery **binder** was then mixed with Fe-1.5%Si alloy powder having a mean particle size of 63 .mu.m. According to these procedures, prepared. . .

DETDESC:

DETD(42)

TABLE 3

Sample No.	**Binder** resin (vol %)	Magnetic powder (vol %)	Magnetic flux density (T) (Hm = 10000. . .	Effective resistivity

DETDESC:

DETD(43)

As . . . density of a core is lower than that in the case of a ferrite core when the content of the **binder** in the magnetic core exceeds 40%, while very high magnetic flux density can be obtained when the content is not. . .

DETDESC:

DETD(44)

Thus, it is possible to obtain magnetic cores suited for their intended use by controlling the content of the **binder** in the cores.

DETDESC:

DETD(45)

The inorganic compounds, the **binder** resin and the **magnetic powder** are not limited to those used in the above Examples, rather there may also be used mica, **alumina** or the like.

CLAIMS:

CLMS(1)

We . . .

core, which comprises a compression molded product comprising:
a soft magnetic material selected from an iron powder, an iron alloy **magnetic powder**, and combinations thereof, said material having a mean particle size of 10 to 100 .mu.m; and
1.5 to 40%, as a total amount in terms of volume ratio, of insulating **binder** resin and a non-ferrite insulating inorganic compound powder.

CLAIMS:

CLMS(2)

2. The magnetic core according to claim 1, wherein said iron powder or iron alloy **magnetic powder**, when its mean particle size is represented by D .mu.m and its resistivity by .rho..mu..OMEGA..multidot.cm, satisfies the relationship, when represented. . .

CLAIMS:

CLMS(4)

4. The magnetic core according to claim 1, wherein said iron powder or iron alloy **magnetic powder** is at least one selected from the group consisting of Fe powder, Fe-Si alloy powder, Fe-Al alloy powder, Fe-Si-Al alloy. . .

CLAIMS:

CLMS(5)

5. The magnetic core according to claim 1, wherein said insulating **binder** resin is at least one selected from the group consisting of epoxy resins, polyamide resins, polyimide resins, polyester resins, polycarbonate. . .

CLAIMS:

CLMS(6)

6. . . . inorganic compound powder is powder of at least one compounds selected from the group consisting of calcium carbonate, silica, magnesia, **alumina**, red iron oxide and glass.

CLAIMS:

CLMS(7)

7. . . . has mean particle size of 1/5 or less of the mean particle size of the iron powder or iron alloy **magnetic powder**.

CLAIMS:

CLMS(8)

8. The magnetic core according to claim 1, wherein the total amount of said **binder** resin and said inorganic compound powder ranges from 1.5 to 40 vol %.

CLAIMS:

CLMS(9)

9. The magnetic core according to claim 8, wherein the ratio of said **binder** resin and said inorganic compound powder is 98 to 20 vol. %:2 to 80 vol. %.

CLAIMS:

CLMS(10)

10. A method of producing an magnetic core, which comprises a step of preparing a **binder** by mixing an insulating inorganic compound powder

with a resin, a step of grinding said **binder** into a powder to prepare a powdery **binder**, and a step of mixing and compression molding said powdery **binder** with iron powder, iron alloy **magnetic powder** or a mixture thereof.